

*On the Lunar Eclipse, 12th July, 1870.*

By C. H. Weston, Esq.

I had hoped, with an Observatory commanding from its elevated position an angle of more than  $90^\circ$  declination, and an uninterrupted eastern horizon belonging to a circle of 120 miles in circumference, to have well witnessed the "First contact with the Shadow" on the Moon's Eastern Limb, north of her equator, and near the Ringebirg *Olbers*. A fixed bank of clouds, however, prevented any observation until the Moon had risen about  $8^\circ$ , when the Earth's shadow was found to have already covered *Hevel*, *Cavalerius*, and parts adjacent to *Reiner*, and had reached the resplendent cliffs of *Aristarchus*, and the almost equally brilliant highlands between *Aristarchus* and *Herodotus*.\*

At this time the whole of the western edge of the shadow was dark, while the east periphery of the Moon was brightly visible. In 10 minutes the shadow north of the equator had reached the base of the great *Copernicus* and districts not far east of *Tycho* (including part of his radial system) on the south; then passing *Eratosthenes*, it touched the southern extremity of the mountain-range of *Apenninus* three minutes later.

After an interval of six minutes the extensive surface, including west of *Sinus Iridum* on the north, and those of the more southerly *Archimedes*, together with the greatest part of *Mare Nubium* and *Tycho* on the south, was observed in shadow.†

At this time the east periphery was reddish, and the western edge of the shadow orange, resulting from the combination of the red tinge and the yellow lunar light beneath. About six minutes later the shadow had reached the districts of the *South Pole*, and near the eastern part of *Mare Serenitatis*. Before the Moon had been so far obscured the *Sinus Iridum* was visible, but after reaching the last described limits all the shaded surface showed its details—the absence of light allowing perhaps a greater dilatation of the pupil of the eye. Now *all* the eclipsed parts were reddish, and the western margin of the shadow purplish.

After 15 minutes the shadow reached as far as the western edge of *Mare Serenitatis* and the eastern portion of *Mare Tranquillitatis*, and on the north, near *Hercules*, and not far from *Endymion*. In two minutes the eastern margin of *Mare Fecunditatis* was in-

\* The telescopes used were Newtonians, 9 and 14.25 inches and 9 and 16 feet respectively—the former on the back of the latter—on the same equatoreal mounting, and thus most readily available for comparative observations.

† During the eclipse, and some days before and after full moon, the region of *Archimedes* was well seen. Besides this Ringebirg there were two others visible, nearly as large in circumference, but apparently less in elevation, than *Archimedes*, more resembling incipient rings common on other parts of the lunar surface. These were clearly the "incipient or low protrusions, *circular and rugged*," mentioned in my paper of December last, and but indistinctly seen in the earlier phases of the Moon.

involved, and two minutes later the eastern part of *Mare Crisium* and the Ringgebirg *Geminus* further north. At this time the bright western crescentic limb of the Moon, contrasted with the eclipsed portions, afforded a fine example of the enlarging effects of irradiation. The disturbed district between *Mare Crisium*, *Mare Tranquillitatis*, and *Mare Fecunditatis*, were finely brought out just before entering the penumbra, and *Proclus* (nächst *Aristarch* das hellste Ringgebirg, B. & M.) was strikingly prominent.

After an interval of five minutes the shadow extended to the west of *Mare Fecunditatis*, and nearly west of *Mare Crisium*, and about three minutes later the phase was total.\*

Now light appeared gradually to extend itself eastward over the lunar surface, and in about eight minutes after the total eclipse the converging ray-system of *Tycho* on the south, and all the country east and west of *Sinus Iridum* on the north, came out to view, while the region about the first impact was still darkish. In about 40 minutes the light was more uniformly diffused over the Moon, and after quarter of an hour the illumination was pretty equal on the east, and west, and south, while the north was darkest. After 10 minutes the east side was the brightest. Small star near the S.W. limb was well seen.

After six minutes the south-eastern periphery was brightest. *Tycho*'s circular structure loomed out. The Moon gradually became darker after the mid-phase, and then the western parts also gradually less visible. *Aristarchus* was a very brilliant object.

Soon the reddish tint on the north-west appeared, which in about four minutes extended over the surface towards the south-east. Then came symptoms of approaching dawn, and two minutes later the north-east above *Grimaldi* began to brighten. Then the concave band of solar light appeared on the lunar disk, passed over *Grimaldi* and the disturbed regions east of, but distant from, *Gassendi*, and in four minutes illuminated the south-east of *Mare Humorum*. Clouds now began to cross the Moon.

Later (six minutes) the light dawned upon *Cichus* (eine grosse Vertiefung, B. & M.), and further south to the south-east of *Tycho*. More clouds. Later obtained a glimpse, and found the light had reached *Tycho*. Another 20 minutes, and the west of the north end of the range of *Apenninus* was illumined. Nothing afterwards was visible.

During the progress of the eclipse the advancing convex shadow of the Earth was observed to produce on the Moon's spherical surface a series of arcs, not *concentric* but *convergent* towards the north periphery; and it should be noted that the returning light impinged first at a point not identical with the shadow's first contact (which must have been near *Olbers*), but at a point a little

\* The region between *Schubert* and the western periphery of the Moon (the last portion involved in shadow) was apparently more extensive than in Mean Moon, and doubtless arose from her libration, the maximum of which would occur two days later.

north-east of *Grimaldi*, several degrees further south than *Olbers* — visible effects of the different relative positions and motions of the Earth and Moon during the period of the eclipse.

*Ensleigh Observatory,  
Lansdowne, Bath, July 1870.*

### *On Mr. Browning's Spectroscope.* By M. C. de Littrow.

(Note addressed to the Foreign Secretary.)

I take the liberty to let you know that the essential idea in Mr. Browning's arrangement of the spectroscope (*Monthly Notices*, vol. xxx. p. 198) has already been executed and published by my deceased son Otto, in the year 1862, as you will find in the annexed treatise (*Proceedings of the Imperial Academy of Sciences of Vienna*, vol. xlvii.). The only difference between the two instruments consists in the sparing of the second telescope, which my son has effectuated by placing a mirror behind the last prism, so that the same telescope serves also as a collimator. Besides this advantage, he obtained thus the double effect of the employed prisms. He enclosed the whole apparatus in its box, so that he needed not darken the room in which he experimented.

I beg the favour of bringing this short note to the knowledge of the readers of your *Monthly Notices*.

*Vienna, July 18, 1870.*

### *Note on the Automatic Spectroscope.* By John Browning.

When constructing the automatic spectroscope which I have recently had the honour of describing to the Society, I saw the desirability of giving a motion to the telescope without the use of a cam. Having spoken to Mr. Proctor on this subject, he told me that he had been convinced, while the new spectroscope was under discussion at the last meeting, that my principle really involved the complete solution of the problem of securing minimum deviation for all orders of light-waves. It was only necessary for the purpose that the slot movement should be extended to the first prism, and to the viewing telescope. It is obvious that in this way the necessary amount of motion will be communicated to the telescope, and also to the first prism, which in the former arrangement was a fixture. I am making an instrument containing this improvement, and hope to have the honour of exhibiting it at the next meeting of the Society in November.

*111 Minorities, July 2, 1870.*